



FRD Activities Report March 2000



Research Programs

Remtech PA1-LR Doppler Sodar Upgrade

Christopher A. Johnson, Field Operations Manager from Secor International Inc. of Fort Collins, Colorado, visited FRD from March 14-16 to upgrade and test the so-called “high power” Remtech PA1-LR Doppler sodar (Figures 1 & 2). This sodar has been permanently installed at the Grid-III research facility on the INEEL. Questions have been raised about the overall reliability and accuracy of this sodar (see the December monthly summary at <http://www.noaa.inel.gov/news/>). The following changes were made to the sodar:



Fig. 1. Remtech PA1-LR Doppler sodar.

⌄ Remtech sodar processing software upgraded from version 6.03 to 7.11. One of the more obvious differences is the acoustic beam firing pattern. Originally, the beam firing sequence was: SE-NE-SE-NE-V, where SE and NE are the oblique angle beams oriented toward the southeast and northeast, respectively, and V is the vertical beam. With the upgraded software, the beam sequence is now: SE-NW-NE-SW-SE-NW-NE-SW-V.

⌄ Because of the long acoustic pulse lengths, the first measurement height (or range gate) has been changed from 50 m to 100 m above ground level.

⌄ New DC signal cable installed that linked the sodar antenna array to the electronics processing box. Even though this signal cable has two shields, great care was taken to make sure that this cable was at least six inches from any AC power cable. In addition, the excess length of this DC signal cable should not be wrapped up in a loop or cross itself.

⌄ Removal of AC power cable for heater wires that kept snow from accumulating around the individual antenna transducers.

⌄ Relocation of a nearby hi-vol sampler



Fig. 2. Array of individual acoustic transceivers.

which created a significant noise source that possessed frequencies similar to that used by the sodar.

℄ Construction of a wall to block noise from the air conditioner for the shelter that housed the sodar electronics.

℄ Diagnostic testing of the 52 transceivers. This test found that 7 out of the 52 transceivers were not operating properly. In Figure 3, the circles represent individual transceivers. Functional transceivers are represented by open circles while the nonfunctional transceivers are marked with solid black circles. More disturbing was the fact that the nonoperating transceivers were clustered together near the center of the antenna array. Most of the acoustic energy is located from these center transceivers. As a result, acoustic range can potentially be degraded because of diminished power and focus of the central beam.

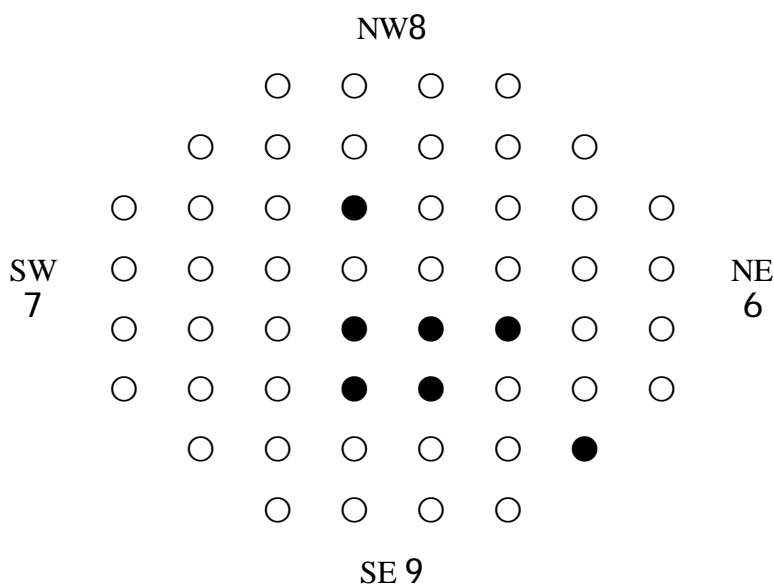


Fig. 3. Representation of the 52-transceiver phased-array antenna.

Early indications show that the upgrade has done little to improve the performance of the sodar. We suspect that the processing algorithms produce unrealistic profiles.

(Jerry.Crescenti@noaa.gov)

Central California Ozone Study (CCOS)

Preparations are under way for deployment of eight meteorological towers and a ground-based remote profiling system for the up coming Central California Ozone Study (CCOS). This four-month field study is scheduled to start on June 1, 2000 and end on September 30, 2000. Tentative locations of the meteorological towers are:

℄ McKittrick	℄ Bodega Bay
℄ Kettleman City	℄ Fairfield
℄ Cambria	℄ Granite Bay
℄ Sunol	℄ Redding

Measurements from these towers include wind speed and wind direction, air temperature, and relative humidity. These data will be recorded as 5-min averages and will be transmitted back to FRD several times per day via phone lines for quality control (QC) screening and distribution to CCOS principle investigators.

The 915-MHz radar wind profiler, radio acoustic sounding system (RASS), and Radian 600PA phased-array Doppler sodar will be deployed on the Carizzo Plain located in the California Valley. Wind profiles acquired by the radar and sodar will be acquired as one-hour averages while temperature profiles obtained from the RASS will be reported once per hour as 5-min averages. These data will also be transmitted to FRD for QC screening and availability to the CCOS community. (Jerry.Crescenti@noaa.gov, Randy Johnson)

High Speed Temperature Probe

Using a solid state switch/multiplexer from Maxim (MAX394), we have chopped the input voltage into an A.C. voltage and feed this signal into an amplifier to reduce the low frequency noise we have experienced from the input of the amplifier. However, the insertion charge caused by the state switch gate capacitance causes a very large voltage spike in comparison to the 40 nV signal of interest. Some work has been done to reduce this noise without much success. We are now back to trying to reduce the input noise on the ultra low noise D.C. amplifier. The first step will be to eliminate noise voltage at the frequencies greater than 50 Hz by using a low pass filter. If this is successful, the very low frequency noise (voltage drift due to time and temperature changes) will be removed with a very low frequency D.C. blocking capacitor. If our efforts to eliminate the unwanted noise are successful, the absolute temperature at a lower frequency and lower resolution will be measured with a second temperature element. (Randy.Johnson@noaa.gov)

Hurricane Balloons

The primary means of communications planned for the hurricane balloons is no longer an option. Over the past year Iridium's schedule to provide satellite data transmission capability has been about 3 to 5 months into the future at any point in time. They went into Chapter 11 Bankruptcy last August and it appeared that as late as early March 2000, that a qualified buyer would be found. A buyer was never found and time ran out on March 17, 2000. Iridium LLC is presently working on a plan to decommission the whole satellite system. On the bright side, since the data capability never became operational, we have not invested in any of the Iridium equipment.

We are presently looking into Globalstar as an alternative to Iridium. We were aware of them as another source, but due to the fact that they were over a year behind Iridium in their plans to have their satellite system operational, we planned on using Iridium. In February 2000 Globalstar announced full commercial availability of voice communications in the United States with data capability expected to be available in the latter part of 2000. We are presently planning to use Globalstar for satellite data communications and are planning to test it out in the latter part of this year. Further into the future, ICO Communications, Teledesic and possibly others, are additional alternatives for smart balloon satellite communications. (Randy.Johnson@noaa.gov)

Model Validation Program

One of the projects that was funded under the Air Force Model Validation Program (MVP) was completed in February. Turbulence data collected from Cape Canaveral using both sonic anemometers and the LongEZ were used to test the turbulence algorithm used in the REEDM dispersion model. REEDM is used both at the Cape and at Vandenburg Air Force Base in California to estimate dispersion of rocket effluent. A final report entitled "Evaluation of the REEDM Climatological Turbulence Algorithm Using Aircraft Measurements" is now in press as a NOAA Technical Memorandum. (Richard.Eckman@noaa.gov)

LongEZ Hardware Additions and Improvements

Improved GPS technology utilizing a dual frequency receiver is currently being integrated into the LongEZ data system. The Ashtech sensors receive signals at both the L1 and L2 bands. This, combined with the recently upgraded DGPS correction software (FLYKIN), will provide accuracy to the sub cm level in position and improve velocities to roughly 1 cm s^{-1} .

Two additional instruments for use in aerosol research were recently purchased. A Passive Cavity Aerosol Spectrometer Probe (PCASP) model 100-X manufactured by Particle Measuring Systems in Boulder, CO, will be used to measure particle size distributions of aerosols ranging from 0.1 to 3.0 microns in diameter. This probe sizes aerosols into one of 15 bins based on the total light scattered from a particle illuminated with a HE-NE laser. A three-wavelength nephelometer manufactured by TSI will provide the total and back-scattering coefficient due to aerosols at three wavelengths. Work is currently under way to interface these instruments with the LongEZ data system. (Jeff.French@noaa.gov)

SHOWEX99

Data for the SHOWEX99 experiment was reprocessed. Several bugs in the new DGPS correction software (FLYKIN) were fixed. Additionally, quality check flags were added to the final output for aid with data QC. A data report is being prepared. (Jeff.French@noaa.gov, Jerry Crescenti, Tim Crawford)

VTMX - CBNP 2000

The sponsors of the Vertical Transport and Mixing Experiment (VTMX) - Chemical and Biological Nonproliferation Program (CBNP) 2000 have invited FRD to participate. We plan to bring our SF6 release and analysis capability to bear on the project. Current plans call for the use of the entire set of FRD SF6 samplers and mobile analyzers during the field deployment. In addition, 40 of FRD's SF6 samplers will be modified to pump into carbon absorption (CATS) tubes as well as into Tedlar® sample bags. A study is underway to determine the feasibility of using CATS tubes in this manner. The study includes the analysis of possible perfluorocarbon (PFT) contamination of the SF6 pumps and bags. Inquiries have also been received to use the mobile radar profiler with RASS system, and sonic anemometers during the study. (Kirk.Clawson@noaa.gov)

Collaboration With WY-MT-ID Departments of Environmental Quality

The heads of the Departments of Environmental Quality from the states of Wyoming, Montana, and Idaho visited the Idaho National Engineering and Environmental Laboratory in March. They were looking for areas where their departments might interact and collaborate with INEEL entities. FRD gave a presentation about its mesonet, modeling, and airborne geosciences capabilities. (Kirk.Clawson@noaa.gov)

Sagebrush Steppe Ecosystem Eddy Correlation/Bowen Ratio Intercomparison

The intercomparison of the eddy correlation and Bowen Ratio methods of calculating the fluxes of water vapor and carbon dioxide is continuing. The eddy correlation system is based around the ATDD open path H₂O and CO₂ sensor. The monitoring site was established in November of last year. Next month, Campbell Scientific, Inc., will join the intercomparison with the installation of its sonic anemometer and LI-Cor Inc.'s new open path H₂O and CO₂ sensor. (Kirk.Clawson@noaa.gov)

Cooperative Research with INEEL

INEEL Mesoscale Meteorological Network Support

Data from the INEEL Mesoscale Meteorological Network is collected via radio link by a computer located in the FRD offices. To improve the reliability of the system, a watch dog program runs on the collection computer and monitors the incoming data. If data collection stops for any reason, the watch dog program initiates a software reboot of the computer. The watch dog program has worked very well for several years, but we have had occasional problems with the software reboot. Several times, the reboot process did not complete and left the computer inoperable. We have added a hardware power controller to the computer to prevent this. The power controller timer is started prior to the initiating the software reboot. If the computer reboot does not complete normally, the power controller will cycle the power on the computer, forcing a hardware reboot. (Roger.Carter@noaa.gov)

Routine inspection and maintenance of the 915MHz radar profiler located on the INEEL found two of the four RASS speakers on the profiler damaged. The speakers were sent in for repair and have been re-installed. (Roger.Carter@noaa.gov)

DOE Acceptance of ANSI/ANS 3.11-00

On February 16, 2000, the Department of Energy approved ANSI/ANS 3.11-00, Determining Meteorological Information at Nuclear Facilities for use at DOE facilities. Jerry Crescenti was among the many contributors to this informative standard. We now have official guidance on instrument performance and maintenance, simple common sense approaches to quality assurance, that we had implemented years earlier. The implementation of this standard will not result in any significant changes in practice at FRD. (Kirk.Clawson@noaa.gov, Jerry Crescenti, and staff)

Annual MDIFF Assessment of INTEC Airborne Radioactive Effluents

The annual run of the MDIFF transport and diffusion model for assessing the effects of DOE's Idaho Nuclear Technology and Engineering Center (INTEC) in 1999 was completed this month. INTEC is the INEEL facility where radioactive liquid waste is being converted to a solid form to reduce the volume of waste and make it safer for disposal through a process called calcining. The result of the model run, for the entire year of 1999 using wind and temperature data from the INEEL mesonet, was not significantly different from any of the previous years for which this exercise was conducted. (Kirk.Clawson@noaa.gov, Rick Eckman, and staff)

Five-year INTEC Consequence Modeling

MDIFF was used to model a constant release from the Calcined Solids Storage Facility 31-meter stack. The simulation was for the 5-year period, from January 1, 1995 through December 31, 1999. The output from the model was normalized total integrated concentrations (TIC) on a 100 x 100 grid centered on the release facility. Isopleths of equal TIC values were plotted on a map of the area surrounding the INTEC facility area. (Kirk.Clawson@noaa.gov, Rick Eckman and staff)

INEEL Mesoscale Modeling

A new project has been initiated to develop a mesoscale modeling capability at FRD. The intention of this effort is to eventually provide high-resolution forecasts of winds and turbulence over the INEEL region. Additionally, the model forecasts could be combined with the MDIFF dispersion model (or another dispersion model) to provide forecasts of contaminant dispersion from INEEL. Some initial flow simulations of the INEEL region have been performed using the MM5 mesoscale model on a Compaq/DEC Alpha computer. These used a 36 km coarse grid covering a 2100 x 1950 km domain and a nested grid centered over INEEL with a 12 km grid spacing. The initial and boundary conditions for the simulations were provided by output from the Eta model, which is available from the National Centers for Environmental Prediction (NCEP). The 12 km grid spacing allows the model to resolve the overall geometry of the Snake River Plain and surrounding mountains, but it does not resolve the individual mountain ranges surrounding INEEL. A higher resolution nested grid will be required to resolve these more local terrain features. (Richard.Eckman@noaa.gov)

INEEL Emergency Operations Center (EOC) Support

A routine drill was conducted at the EOC on the morning of March 8, 2000. The scenario involved a 6.2 magnitude earthquake striking the Colorado Front Range. As the drill played out, no radioactive releases were detected from the Fort St. Vrain depot; however, a site worker broke his leg. NOAA meteorologists provided current observations and short-range forecasts to the Planning Support Director and other EOC members. The only concern expressed by the NOAA meteorology team during the drill was that someone reported the Pasquill-Gifford stability as class A. This was not the case since very strong winds and negligible solar heating dominated the Front Range on this day. Thus, the PG stability was corrected to class D. During the critique after the conclusion of the drill, the NOAA meteorology team emphasized the importance of using the correct stability class since model outputs of downwind radioactive releases will vary greatly. (Jerry.Crescenti@noaa.gov, Rick Eckman, Jeff French)

Emergency Operations personnel from DOE were trained in the use of InelViz during the month of March. Training is provided to familiarize personnel with the user interface and interpretation of the meteorological data. Introduction to the MDIFF plume dispersion display and model interpretation was also provided. In addition to the training, a web page supporting InelViz was developed. This page can be seen at <http://www.noaa.inel.gov/inelviz> and provides access to the Inelviz installation program and a PDF version of the training manual. (Brad.Reese@noaa.gov)

The FRD employees newly assigned to Emergency Operations Center duty rotations, were introduced to INEELViz through the standard FRD training program. Following the introduction, they were oriented by BBWI Emergency Preparedness and FRD personnel at the EOC. A tour of the facility was provided as well as detailed instructions on emergency procedures in the EOC. The new employees subsequently participated in the Fort St. Vrain drill. (Kirk.Clawson@noaa.gov)

Other Activities

FRD Educational Outreach

FRD has been actively developing, with the State of Idaho INEEL Oversight Program, a meteorological/radiological workbook for public schools. The workbook is designed to give students hands-on experience with meteorological instruments and data collection. The in-class reading materials, class activities and cross-curricular projects will give students the fundamentals to begin exploring the many ways meteorological events influence human life. The workbook has been completed and is available on the web (<http://oversite.inel.gov/Education/>). The workbook is generating some interest from school teachers in the local schools for a meteorologist to visit the classroom. We have attempted to satisfy this demand, but have exhausted the small amount of money we could scrape together to fund this effort. After checking with the NOAA Outreach Program Office, we determined that although NOAA encourages this type of outreach, it does not fund it. Therefore, we must sharply curtail our efforts or seek funding through other avenues. (Timothy.Crawford@noaa.gov, Kirk Clawson, and Jerry Crescenti)

NOAA Long Range Facility Planning Proposal

FRD submitted two requests to the NOAA for long range facility planning. We requested that NOAA fund a new office building and laboratory to replace the current building which was built on an old landfill and is deteriorating due to the uneven settling of the earth. We also requested that NOAA fund the building of a staging facility to house the development and enhancement instrumentation dedicated to the airborne geosciences and smart balloon programs. (Kirk.Clawson@noaa.gov)

Proposals

Autonomous Flux Vehicle (AFV) for Hurricane Research by Timothy L. Crawford, Gennaro H. Crescenti, and Jeffrey R. French. Planning letter was submitted to NASA's UAV-Based Science Demonstration Program.

Smart Balloons for Tracking Asian Pollution by Randy Johnson and Roger Carter. Proposal was submitted to NASA in response to their Research Announcement (NRA-00-OES-01) for the 2001 TRACE-P experiment.

Budgetary Estimates for tracer sampling and smart balloons for Devine Umpire by Tom Watson and Randy Johnson was sent to Chris Biltoft and Ed Totin in response to their request. Project is expected to take place sometime between the September 2000 and April 2001.

Papers

Vickers D., L. Mahrt, J. Sun, and T. Crawford. In Draft. Aircraft observations of the mean flow and turbulence near the coast.

Crawford, T. L. and R. J. Dobosy. Submitted. Accuracy and Utility of Aircraft Flux Measurements. In Editors: J H C Gash and P Kabat , BAHC SYNTHESIS: Section D: Integrated Terrestrial Experiments.

Carter, R. G., and R. Ridenour. In ARL Review. An Improved Short Term Transport and Dispersion Forecasting Method.

Eckman, R. M.. 2000. In Press. Evaluation of the REEDM Climatological Turbulence Algorithm Using Aircraft Measurements. NOAA Technical Memorandum, ERL ARL- .

Papers Reviewed

Inter-annual Variations in Summertime Water and CO₂ Fluxes over Rangeland by Tilden Meyers of ATDD in preparation for submission to Agricultural and Forest Meteorology.
(Kirk.Clawson@noaa.gov)

Travel

March 28-31, 2000 Jeff French and Shane Beard Boulder, CO and to Laramie, WY to meet with engineers and scientists at the University of Wyoming. Discussions with Perry Weschler focused on the UW CCN counter and aerosol inlet systems on aircraft. Possible collaborations for upcoming field programs were the basis of discussion with Dr. Jeff Snider. Ideas for these investigations include cloud-aerosol linkage and BL aerosol transport.

Visitors

Hank Kordek, the MASC Regional Property Manager, visited the FRD facility March 6-8. During that time, he met with the staff and discussed background on property management regulations and practices, and how they affect us. He also conducted a training session on personal property management, and met with the FRD Director and Property Custodian to discuss specific problems and ways to streamline FRD property management procedures and property disposal. It was an informative and valuable visit.

Christopher A. Johnson from Secor International Inc., visited FRD from March 14-16 to upgrade and test the Remtech PA1-LR Doppler sodar.

Training

Tim Crawford, Kirk Clawson, Randy Johnson, Paula Fee and Joyce Silvester participated in the Personal Property Management Training Class conducted by Hank Kordek during his visit to Idaho Falls. The class covered the responsibilities of property management personnel, property accountability and object class codes, what constitutes “sensitive” property, property disposal procedures, property reconciliation, and internet information and tools available for property management. Specific FRD needs were discussed and suggestions made to provide for those needs with the minimum amount of effort and time. The information from this training will be of value in the day-to-day property management activities at FRD.

Jeffrey French and Shane Beard attended an aerosol instrumentation training session on March 29, 2000. The session was conducted by Particle Measuring Systems in Boulder, Co. It covered basic maintenance, upkeep, and calibration of the PCASP-100X. Topics included cleaning and aligning optics, monitoring and changing laser, adjusting inflow jet, adjusting gains and offsets, and basic trouble shooting methods.

Human Resources

Effective March 26, 2000, Dr. Thomas B. Watson, Research Chemist, was assigned to OAR’s Office of Scientific Support and is being detailed to the NOAA Policy and Strategic Planning Office. This is a 18-month temporary detail.

Dianne J. Hoover, retired on March 31, 2000 after 12 years of Federal service. We are looking for a replacement Physical Scientist. The announcement opened April 6 and will close in four weeks. A bachelor’s degree in some physical science or engineering discipline is required. For more information see: <http://www.usajobs.opm.gov/wfjic/jobs/BQ4825.HTM>